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I further certify that pursuant to the provisions of Section 38(1) of the Patents Act 1990 a complete specification was filed on 19 April 2001 and it is an associated application to Provisional Application No. PR 0074 and has been allocated No. 38761/01.

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PROVISIONAL SPECIFICATION FOR THE INVENTION ENTITLED:

A Method and System for Using Multiple Smartcards in a Reader

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This invention is best described in the following statement:

A METHOD AND SYSTEM FOR USING MULTIPLE SMARTCARDS IN A READER

Technical Field of the Invention

The present invention relates to a method and system for using multiple smartcards in a smartcard reader. The present invention also relates to a method and apparatus for interfacing between an application and a single smartcard reader. Additionally, the present invention relates to a computer readable medium comprising a computer program for interfacing between an application and a single card reader.

Background Art

Smartcards have become increasingly popular in recent years. Smartcards are currently used for various purposes including initiating an application program and initiating a new session with a device or application program. In many applications the insertion of a controlling smartcard, or the first use of this smartcard after insertion, is a signal to activate an application or to start a new session. When it involves initiating an application, this may be from the card itself or from the computer system that the smartcard reader is connected to, either directly, or via the network.

While a smartcard is inserted in the reader, a running application may request data that is on another smartcard or require operations to be performed using another smartcard. This is often supported with the provision of a second reader for the data. For example, many handheld units for smartcards or credit cards, which are used at a point-of-sale have a reader in a compartment on the back in which a card associated with the salesperson is placed throughout their shift. During this shift, cards of various customers are placed into a reader on the front of the unit. During each transaction, information is read from both the front reader and the back reader.

Typically, where the reading of two cards is required to perform an operation, it is not usual for the same reader mechanism to be used for both cards. Instead, two readers are often used. In some cases (such as the point-of-sale example given above), this is because of the inconvenience of continually swapping cards. In other cases, such as a card-controlled photocopier or a payphone, this is because the ejection of the

controlling smartcard from its reader is a signal to terminate the current session. This is a disadvantage in situations where cost is important or space does not permit the use of two readers.

Summary of the Invention

It is an object of the present invention to substantially overcome, or at least ameliorate, one or more disadvantages of existing arrangements.

According to a first aspect of the invention, there is provided a method of using multiple smartcards with a single reader, wherein the method comprises: executing an application upon an insertion of a first smartcard into the reader; requesting an insertion of a second smartcard into the reader; and performing an action upon an insertion of the second smartcard into the reader.

According to a second aspect of the invention, there is provided a system for using multiple smartcards, wherein the system comprises: a single smartcard reader; a processor; and communication means for communicating between said single smartcard reader and said processor; wherein the processor comprises: means for executing an application upon an insertion of a first smartcard into the reader; means for requesting an insertion of a second smartcard into the reader; and means for performing an action upon an insertion of the second smartcard into the reader.

According to a third aspect of the invention, there is provided a method of interfacing between an application and a single smartcard reader, wherein the method comprises: executing said application upon insertion of a first smartcard into the reader; and transmitting, upon insertion of a second smartcard into the reader, data read from the second smartcard to said executing application.

According to a fourth aspect of the invention, there is provided apparatus for interfacing between an application and a single smartcard reader, wherein the apparatus comprises: means for executing said application upon insertion of a first smartcard into the reader; and means for transmitting, upon insertion of a second smartcard into the reader, data read from the second smartcard to said executing application.

According to a fifth aspect of the invention, there is provided a computer readable medium comprising a computer program for interfacing between an application and a single smartcard reader, wherein the computer program comprises: code for executing said application upon insertion of a first smartcard into the reader; and code for transmitting, upon insertion of a second smartcard into the reader, data read from the second smartcard to said executing application.

Brief Description of the Drawings

A number of embodiments of the present invention will now be described with reference to the drawings, in which:

Fig. 1 is a perspective view of a smartcard and a smartcard reader;

Figs. 2-4 are each views of the reverse side of different smartcards;

Fig. 5 is a longitudinal cross-sectional view through the line V-V of Fig. 2;

Fig. 6 is a schematic perspective view of all the items of equipment, which go to make up the system;

Fig. 7A shows a process flow diagram from the perspective of the card reader into which a smartcard as described is inserted;

Fig. 7B shows in more detail the processes of steps 702 to 712 of Fig. 7A;

Fig. 7C shows a process flow diagram from the perspective of the application associated with a smartcard as described;

Fig. 8 shows a flow chart of a method of using multiple smartcards on a single card reader;

Fig. 9 shows a schematic block diagram of the system for implementing the method of Fig. 8;

Figs. 10A and 10B show a control flow diagram of the session manager of Fig. 9; and

Fig. 11 shows a block diagram of a general-purpose computer suitable for use in the system of Fig. 9.

Detailed Description including Best Mode

Where reference is made in any one or more of the accompanying drawings to steps and/or features, which have the same reference numerals, those steps and/or features have for the purposes of this description the same function(s) or operation(s), unless the contrary intention appears.

The principles of the method(s) described herein have general applicability to smartcards in general. However, for ease of explanation, the steps of the method(s) are described with reference to smartcard interface systems in which a single application has multiple interface cards. Smartcards used in such systems have a large number of fields of use due to the customisable nature of the user interface. However, it is not intended that the present invention be limited to these described smartcards and systems. For example, the invention may include applications where one or more of the multiple cards used are "standard smartcards". The "standard smartcard" typically does not have a user operable interface on the card itself.

In Fig. 1, there is illustrated a smartcard reader 1 having a housing 2 in which is formed a bay 4 and a viewing area 6. Data reading means are provided in the form of exposed reader contacts 7 and associated control circuitry (not illustrated). The smartcard reader 1 also includes key means in the form of a substantially transparent pressure sensitive membrane 8, which covers the viewing area 6. The smartcard reader 1 is configured for use with a smartcard 10 which has a planar, preferably laminar, substrate 12 with a plurality of indicia 13 on its front face. As best seen in Fig. 5 the indicia 13 can be applied by printing, by adhering, or any other conventional process. As also seen in Fig. 5, the smartcard 1 includes an electronic memory in the form of an on-board memory chip 15 which is connected with card contacts 16 which cooperate with the reader contacts 7.

In use, the smartcard 10 is inserted into the bay 4 with its front face 11 facing towards the pressure sensitive membrane 8. As a consequence the pressure sensitive membrane 8 covers the front face 11 but the control indicia 13 are visible within the viewing area 6 because the pressure sensitive membrane 8 is transparent.

The reader contacts 7 and associated circuitry are configured to read mapping data associated with the control indicia 13 and stored in the memory chip 15. This reading can take place either automatically upon insertion of the smartcard 10 into the bay 4 or selectively in response to a signal from the smartcard reader 1. This signal can, for example, be transmitted to the smartcard reader 1 via the exposed reader contacts 7 and card contacts 16.

Once the mapping data associated with the indicia 13 has been read, a user can press areas of the pressure sensitive membrane 8 overlying or immediately adjacent to the underlying indicia 13. By sensing the pressure on the pressure sensitive membrane 8, and referring to the mapping data, the smartcard reader 1 can deduce which of the indicia 13 the user has pressed. In this way, although the indicia 13 have no mechanical or electrical function, when placed under the transparent pressure sensitive membrane 8, the indicia effectively become keys operable by the user and the function of the key is determined by the mapping data.

In its preferred form, the smartcard reader 1 includes a transceiver, which utilises an aerial 5 for transmitting and receiving radio frequencies. The transceiver circuit is not illustrated but is of conventional form but it will be understood by those skilled in the art that an infra-red transmitter or other forms of data transmission, including hard wiring, can be used.

Upon selection of one of the indicia 13, the smartcard reader 1 causes information related to the selection to be transmitted via the aerial 5 to a visual display unit 20 (Fig. 6) which includes a corresponding aerial and associated transceiver 25. Thus in the preferred form, information can be transmitted between the visual display unit 20 and the smartcard reader 1 in both directions and can include, for example, hand shaking data, set up information, or any other form of information desired to be transferred between the two devices.

Turning now to Fig. 3, there is shown an alternative arrangement 100 to the smartcard 10 of Figs. 1 and 2. In the smartcard 100 indicia 13 are (as before) provided on the front face (not illustrated in Fig. 3). However the memory storage for the

smartcard 100 takes the form of a magnetic strip 115 formed along the rear face 114 of the smartcard 100. The mapping data and any other information, which is stored in the magnetic strip 115 is stored in conventional manner. The smartcard reader (not illustrated) to cooperate with the smartcard 100 includes a magnetic read head positioned at, or adjacent, the corresponding bay of the reader. As the control card 100 is inserted into the bay the mapping data is automatically read from the magnetic strip 115 by the magnetic read head. In all other respects the magnetic card reader for the smartcard 100 is then operated as described in relation to the arrangement of Fig. 1.

Fig. 4 shows another arrangement of a smartcard 200 in which the storage means takes the form of a machine-readable bar code 215 printed on the rear face 214 of the smartcard 200. The mapping data, etc is encoded within the bar code. The corresponding smartcard reader (not illustrated) for the smartcard 200 includes an optical read head positioned at, or adjacent, the entrance to the reader bay. As the smartcard 200 is slid into the bay, the mapping data, etc are automatically read from the bar code 215 by the optical read head. Alternatively, the bar code can be scanned using a bar code reader associated with the smartcard reader immediately prior to inserting the smartcard, or can even be scanned by an internal bar code reader scanner once the smartcard 200 has been completely inserted into the smartcard reader.

Turning now to Fig. 6, the other components of the overall system are illustrated. In addition to the smartcard 10 (100 or 200) there is a smartcard programmer 30 which is connected to, and controlled by, a personal computer (PC) 31. When the smartcard 10, 100, 200 is inserted in the smartcard programmer 30, data entered into the PC 31 can be used to program the memory chip 15, magnetic strip 115 or bar code 215. The system also comprises a smartcard reader 8 for reading the programmed smartcard 10 (100 or 200). The smartcard reader 8 in response to a user selection of the indicia 13 on the smartcard 10 (100 or 200) causes information related to the selection to be conveyed to a visual display unit 20 (such as personal computer) via a corresponding aerial 25 and associated transceiver.

Fig. 7A presents a process flow diagram from the perspective of the card reader into which a smartcard as described is inserted. In a process step 700 the card insertion is detected, whereafter in a process step 702, the card reader detects that the user has touched one of the designated regions. In the initial detection step 700, the card reader retrieves from the smartcard memory, an unique identifier and address of the application associated with the card. In the following process step 704, the card reader makes reference to mapping information in order to identify the particular region pressed by the user, whereafter in step 706 the command associated with the particular region in question is retrieved from a memory. In a process step 708, the particular command being requested through touching the specified region is sent to the application in question.

The smartcard as described has stored in its memory a list of x-y coordinates and commands associated with the "buttons", "icons", and/or "regions" of the smartcard. For instance, each member of the list may have the syntax {TL,BR, "COMMAND" }, where TL and BR are the x-y coordinates of the top left hand corner and bottom right hand corner respectively of the associated "button" , "icon" or "region" on the smartcard, and where "COMMAND" is the associated command to be performed by pressing the associated "button", "icon", or "region". Some examples of "COMMAND" may be load URL address, or down load file etc. Preferably, the syntax allows multiple commands for each TL, BR coordinate. For instance, a member of the list may comprise in addition to a command designated by the "button", a further command for retrieving and playing a particular sound sample for feedback to the user as previously described.

Turning now to Fig. 7B, there is shown in more detail the processes of steps 702 to 712 of Fig. 7A. In a process step 702, the card reader determines the x-y coordinates of the area on the smartcard, which has been pressed by the user. The process then continues to decision block 718, where a check is made by the card reader whether these pressed x-y coordinates match the coordinates TL, BR of a first member {TL, BR, "COMMAND"} of the list, which has been retrieved from memory in the smartcard. If the x-y coordinates pressed by the user do not match to the coordinates TL, BR of the first

member then the decision block 718 returns false (no) and the process continues to decision block 720. In decision block 720, a check is made whether the current member of the list is the last member of the list. If the decision block 720 returns false (no) then the process continues to process step 722, where the card reader increments to the next member of the list. Otherwise if the decision block 720 returns true (yes), the process then terminates awaiting further user input. The card reader, thus increments through the list, checking the TL, BR coordinates of each member against the pressed x-y coordinates until a match is found. If no match is found the process terminates.

In the event the decision block 718 returns true (yes), that is if the pressed x-y coordinates match the TL, BR coordinates of a member {TL, BR, "COMMAND"} of the list, then the process continues to process step 724. Preferably, TL and BR define a region or area on the smartcard and a match is found when the x-y coordinates of the area pressed by the user fall or partly fall within the region or area defined by TL and BR. In the next process step 724, the card reader retrieves the "COMMAND" associated with the matched coordinates and then sends 726 the "COMMAND" to the particular application in question. The card reader already knows the unique identifier and address of the application from the initial detection of the card. After step 726, the process then terminates awaiting further user input.

Fig. 7C presents a process flow diagram from the perspective of the application associated with a smartcard as described. There are many different configurations of applications suitable for use with the smartcards. For instance, the application can be located remotely on a server. Alternatively, it can also be located locally on a personal computer. The application can be a set top box, such as a VCR. Also, the application can either be implemented as software or hardware. For instance, the card reader may send a series of bits to a TV to remotely change the channels. Turning now to Fig. 7C, the process of the application is described. In a process step 750, the application receives a "COMMAND" from the card reader corresponding to the "icon" , "button" or "region" on the smartcard pressed by the user. The application in the next process step 752, performs the "COMMAND". For instance, the application can be an internet browser and

the command "load a URL address". In another example, the application can be a telephone communications package in a telephone and the command "Phone 999 9999".

Turning now to Fig. 8, there is shown a flow chart of a method of using multiple smartcards on a single card reader. A controlling smartcard 10 (100 or 200) comprises a program or an address to an application, such as for example an Internet home shopping program. The method commences 802 when the user inserts the controlling smartcard 10 (100 or 200) into the smartcard reader 8. When inserted into the smartcard reader 8, the reader automatically causes the application to be started up 804 on the computer system. Alternatively, the application program may be started 804 by the user pressing a Start "button" on the controlling smartcard 10 (100 or 200). Once the application program has started the user is able to commence interaction with the program via the "buttons" on the controlling smartcard 10 (100 or 200). If the user is solely interacting with the application with the controlling smartcard, then the program runs until the user ejects 820 the controlling smartcard 10 (100 or 200) from the reader 8 whereupon it is terminated 822. However, the application in response to a user interaction may request further information from the user. For example, if the user wishes to buy something on the Internet home shopping program, the program may ask for a shipping address. In order to avoid having to provide a keyboard to enter the information, the information is held on a second smartcard 10 (or 100 or 200).

Each smartcard 10 (100 or 200) holds a unique identifier that labels it as corresponding to a particular application. When a smartcard 10 (100 or 200) is inserted 802 into the reader 8, the unique identifier, such as "HomeShopping", causes an overall controlling program on the computer system to start 804 the application indicated. The user may then commence user interaction 806 with the application.

The application during this user interaction checks in decision block 808 whether the user has performed a particular user interaction. In a variation of this arrangement, the application may, instead of in response to an user interaction, automatically request and wait 810 for a second smartcard. In this case, the decision block 808 can be dispensed. In the event the decision block 808 returns Yes (TRUE), the applications

proceeds to step 810, where the application requests and then waits for the insertion of the second smartcard 10 (100 or 200). The application, for instance the home shopping application, also sends during step 810 an message to the overall controlling program, naming the unique identifier of the second smartcard 10 (100 or 200), say "PersonalInfo". In this fashion, the overall controlling program is aware that a second smartcard has been requested and it knows the identity of the second smartcard. Consequently the change of the smartcard does not trigger an application change, i.e. the termination of the HomeShopping application and the starting of the PersonalInfo application. The waiting step 810 may have a timeout period after which an application is terminated. After such a period, the insertion of a card would be treated as the insertion of a controlling card.

After the user has inserted 818 the second smartcard 10 (100 or 200), the method proceeds to decision block 814, where the overall controlling program checks whether the unique identifier of the inserted second smartcard 10 (100 or 200) is the same as the unique identifier currently stored by the overall controlling program. In the event, the decision block 814 returns No (FALSE), the method proceeds to decision block 816, where the overall controlling program checks whether the unique indentifier of the inserted second smartcard 10 (100 or 200) is the same as the unique identifier previously stored by the overall controlling program. In the event the decision block 816 returns Yes(True), the method returns to the application for further user interaction 806. On the other hand, if decision block 816 returns No (FALSE), the method returns to step 810 to wait for the insertion of the second smartcard 10 (100 or 200). In the event, the decision block 814 returns Yes (TRUE), the method proceeds to step 812, where the application uses the information stored on the second smartcard 10 (100 or 200). After completion of step 812, the method returns to step 806 for further processing. Preferably, the second smartcard provides 812 data to the application initiated by the controlling smartcard. The application reads the second smartcard as required, and if a new smartcard is then inserted which is the controlling smartcard, the application will continue. On the other hand, if the newly inserted smartcard is not the second or controlling smartcard, the application is terminated and the new application corresponding to the new controlling card is executed.

Preferably, the user is warned that the current application is to terminate and gives the user a chance to insert a different card.

In the event the decision block 808 returns No, that is the user has not performed the particular user interaction, the application continues operation with further user interaction. The application runs until the user ejects 820 the controlling smartcard 10 (100 or 200) from the reader 8 whereupon the application is terminated 822.

In this way, the method is able to distinguish those instances where the removal of a card is intended to signal the end of a session from those instances where the removal of a card is done in order to insert a different card required in the same session and hence leaving the current session active.

Turning now to Fig. 9, there is shown a schematic block diagram of the system for implementing the method of Fig. 8. The system comprises a smartcard reader 8 including a transceiver, a signal receiver 25, a session manager 906, an application execution environment 908, and a set of stored application programs 910. The session manager 906 is the overall controlling program described previously and runs on a general-purpose computer 31, set-top box, or some other device with computational ability. The stored applications 910 are executed in an execution environment 908 on the general-purpose computer or some other device. The applications may be stored locally on the general-purpose computer or remotely on a network.

The smartcard reader 8 sends signals corresponding to card insertion, card removal, and card operations as discussed previously, which are received by the signal receiver 25. The session manager 906 communicates with the signal receiver 25 via an application programming interface such that it is notified of these card events by messages, namely card insertion, card removal, and card operations. The session manager 906 controls the loading, execution and termination of the applications in the application execution environment 908 and communicates with these applications, for example using inter-process communication.

The session manager 906 can be implemented using the following high level pseudo-code. This pseudo-code implementation of the session manager is depicted in

Figs. 10A and 10B as a control flow diagram. For ease of explanation, the reference numerals in the following pseudo-code correspond to the reference numerals shown in Figs. 10A and 10B.

Pseudo-code – Session Manager:

(1) While power is on, repeat the following:

(1.1) Wait for card insertion event from signal receiver.

(1.2) Determine application to execute from card insertion event. The data sent with the card insertion event comprises a name or unique identifier for the application.

(1.3) Load and execute store application in the application execution environment.

(1.4) While application is executing, repeat the following:

(1.4.1) Wait for event from signal receiver or message from the executing application.

(1.4.2) If card-removal event received, terminate application and exit this loop. Namely go to 1.1.

(1.4.3) If card-operation event received, pass this card operation onto the executing application, for example by inter-process communication and goto 1.4.1.

(1.4.4) If new-card requested message received (with details of necessary criteria which the new card must match i.e ID), do the following:

(1.4.4.1) Wait for card-removal event. The application would have prompted the user to remove the card and insert another card to be used by the executing application.

(1.4.4.2) Repeat the following:

(1.4.4.2.1) Wait for card-insertion event.

(1.4.4.2.2) If the new card does not match the criteria specified by the new card request message and is not the controlling card, exit this loop and the outer one and goto 1.2. The inserted card is treated as a new controlling card. In a further variation, the session manager would warn the user that the current application is to terminate and give the user a opportunity to insert the correct card.

(1.4.4.2.3) If the new card is the controlling card associated with the executing application, exit this loop and goto 1.4.1.

(1.4.4.2.4) If the new card matches the requested criteria, repeat the following:

(1.4.4.2.4.1) Wait for event from the signal receiver or message from the application.

(1.4.4.2.4.2) If card-operation received, pass this card operation on to the executing application by, for example, inter-process communication.

(1.4.4.2.4.3) If card removal event received, exit this loop and goto 1.4.4.2.1.

(1.4.4.2.4.4) If application-complete message received from the executing application, terminate the application and exit this loop and goto 1.1

The session manager 906 effectively operates in two modes. In the first mode, if a card insertion event is detected the corresponding application is loaded and executed, while if a card removal event is detected the application is terminated. In the second mode, if a card removal event is detected following receipt of a new card requested message, the application is not terminated but waits for the insertion of a second smartcard. If a card insertion event is detected following receipt of a new card requested message, and the newly inserted card satisfies the criterion specified, the session manager 906 will read the newly inserted second smartcard.

Although the above pseudo-code discusses card-insertion events and card-removal events, these events may not correspond with signals sent from the reader to the receiver. The session manager can infer these events by examining the card-operation events and determining whether consecutive operations have come from the same card or not.

The method described with reference to Fig. 8 is concerned with an application waiting for the insertion of a specific non-controlling card. In a variation of this method, an application may instead specify any number of constraints for the cards for which it is waiting. These could include, without limitation, cards from a specific vendor, cards

associated with a specific application or service, cards which specify conformance to a specific schema, cards specifying a creation date within a specific range, etc. An application may even specify that it is waiting for the insertion of any card (which may be used for example in the case of a card duplication application).

The method described with reference to Fig. 8 is concerned with a method where only one non-controlling card is used. In a variation of this method, a controlling application may place a restriction that there only be one non-controlling card be inserted or it may set a specific limit on the number of non-controlling cards to be inserted in sequence or it may place no limit. For example, an "address book" card may be used for adding addresses to an electronic address book. The address book maintenance application may prompt the user to insert business cards (viz smartcards) so that the addresses they represent can be added to the address book. A user may insert any number of business cards in sequence and, when finished, insert the address book card again to indicate completion.

The method described with reference to Fig. 8 is concerned with a method where the non-controlling card is used for the reading of data. In a variation of this method, the non-controlling card can be used for any other purpose, including, without limitation, having data read from it, having data written to it, the initiation of an application in the context of the controlling application (for example, a Java applet running within a web page initially loaded by the controlling card), etc.

In a particular application of the method described with reference to Fig. 8, a system supporting voice or video communications can be operated using multiple smartcards. An initial smartcard, Card A, would be inserted which initiates the application. Card A might comprise an electronic representation of the user's contact details (name, address, etc) which is used by the application (for example, to put in the headers of message sent, or to identify the user in a videoconference). Where Card A is additionally being used as a user interface to the application (eg where the reader has a transparent touchscreen), the card would have controls for the various functions (eg to start recording a video messages and to stop recording). When a user wishes to

communicate with somebody (eg send a message or start a live session), he or she inserts Card B, which is a business card, address card or some other card comprising an electronic representation of the person's address. In this context, Card B is being used as a non-controlling card. The address is extracted from Card B by the application requesting this information from the reader, which then reads the information from Card B. Alternatively, where Card B can be used as a user interface, the address is extracted by the user pressing over the appropriate part of Card B, which causes the reader to extract this information from Card B and send it to the application. Where a user wishes to communicate with multiple people simultaneously (eg a video e-mail sent to multiple people, a multi-party audio-conference, etc), multiple business cards or address cards can be inserted in sequence (Cards C, D, E and so on) with each selected person being added to the list of parties. The completion of the list would be indicated by the reinsertion of the controlling card (Card A) or by some other means determined by the application (eg if there is a specific upper limit on the number of cards to be entered).

In a further variation of the method, the non-controlling card may comprise a single address or could comprise multiple addresses, which can be selected from by the user. The process of selection will depend on the nature of the application and the reader but could include selection over a particular position on the card through a transparent touchscreen, selection from a list of addresses extracted from the card and displayed on a screen, etc.

The above mentioned method and variations thereof show that a non-controlling card can be used for various purposes including reading and writing of data. In a further variation of the method, a card that operates as a non-controlling card in a specific context (eg where a controlling card has specified that it is waiting for a card), may also operate as a controlling card in another context (eg where it is inserted when the card-reading system is waiting for a controlling card). For example, a smart business card could be inserted into a reader and used as a means of contacting the person described on the card. The business card could initiate an application, which allows a video-conference with that person to be initiated. This scenario involves it being used as a controlling card.

However, in a different scenario, a generic video-conferencing control card may be in operation and the user wishes to add another participant to a conference. The user could place the business card for the person into the reader as a non-controlling card and initiate the person's involvement in the conference.

In a further variation, the method supports an adventure game. In this case, the controlling card, Card F, initiates a game and other cards represent characters, weapons, personality traits, locations or some other object or property. For example, insertion of Card F could initiate the application and display an imaginary world. Card F could then be removed and Card G, representing Character G could then be inserted and Character G would be displayed on the screen. Controls on Card G, seen and used through a transparent touch-screen, could be used to direct Character G through the imaginary world. Character G may discover objects (eg treasure) which a user can save onto Card G using the controls. If the user wants Character G to use Weapon H, the user would remove Card G and insert Card H resulting in a change to the display such that Character G is holding Weapon H. The application would inform the method of the constraints required to be satisfied for the application to stay active. For example, in the case of this application, the application could inform the method that it is waiting for any card which is from the "AdventureGame" game made by the "GreatGames" game development company. This constraint information may be specified by the application in textual form as attribute/value pairs, using data conforming to a structured data format (such as XML), using registered numeric identifiers or by some other means. In this example, if a user were to insert Card X corresponding to a home shopping application which specifies Vendor Y, the method would recognise that this does not satisfy the constraints for the awaited card and would start the corresponding new application.

There are clearly a large number of applications to which the method and its variations thereof apply. These can include the following applications without being limited thereto. In particular application, the controlling card can be used as card-duplicating card. When the card-duplicating card is inserted, it initiates an application which prompts the user to insert the card being duplicated (the "Source Card"). When the

user has done this, the application reads from the Source Card and then prompts for the insertion of the "Target Card". The user then inserts the Target Card and the saved contents from the Source Card are copied onto the Target Card. In another application, the controlling card, Card M, supports the searching or browsing of content (eg online music or images) and the purchase or retrieval of all or parts of this content. In this case, when a user requests purchase or retrieval of content, the application would prompt for the insertion of a card, Card N, or multiple cards, for the storage of the content or references to the content. After the content or reference to the content has been stored on Card N, Card N can now act as a controlling card in other contexts. For example, Card N could now be used in the absence of Card M for listening to the previously selected or purchased music.

In a further variation of the method, the insertion of the non-controlling card leads to the execution of an application associated with this non-controlling card but which is run in a different mode or application context than that in which it would be run if the controlling application were not active. For example, a user may have a controlling card for an adventure game. This card, when inserted in a reader, starts the base application, which allows the user to play the adventure game. At some point in the game, the user may insert a card representing a set of weapons for a character to use. The insertion of this card in the context of the running application has the effect that the card is treated as a non-controlling card. In this case an application associated with the new card (either resident on the card, referred to by the card, or associated by some other means with the identified card) would be started but it would be started in a non-controlling mode. For the card representing a set of weapons, for instance, the application running in a non-controlling mode may result in a selection box being presented to the user to allow them to select a weapon to use. This would differ from the behaviour of the application if running in a controlling context. The insertion of the same card being used as a controlling card would mean that the application would run in a controlling mode and exhibit different behaviour (eg start a weapon management application).

The session manager 906 and applications are preferably practiced using a general-purpose computer system 1100, such as that shown in Fig. 11 wherein the session manager 906 and applications 910 are implemented as software executing within the computer system 1100. In particular, the session manager 906 and applications 910 are effected by instructions in the software that are carried out by the computer. The software may be stored in a computer readable medium, including the storage devices described below, for example. The software is loaded into the computer from the computer readable medium, and then executed by the computer. A computer readable medium having such software or computer program recorded on it is a computer program product. The use of the computer program product in the computer preferably effects an advantageous apparatus for using multiple smartcards.

The computer system 1100 comprises a computer module 1101, input devices such as a keyboard 1102 and mouse 1103, and output devices including a printer 1115 and a display device 1114. A Modulator-Demodulator (Modem) transceiver device 1116 is used by the computer module 1101 for communicating to and from a communications network 1120, for example connectable via a telephone line 1121 or other functional medium. The modem 1116 can be used to obtain access to the Internet, and other network systems, such as a Local Area Network (LAN) or a Wide Area Network (WAN). A signal receiver 25 is used by the computer module 1101 for communicating to and from a smartcard reader 8 (not shown).

The computer module 1101 typically includes at least one processor unit 1105, a memory unit 1106, for example formed from semiconductor random access memory (RAM) and read only memory (ROM), input/output (I/O) interfaces including a video interface 1107, and an I/O interface 1113 for the keyboard 1102 and mouse 1103 and optionally a joystick (not illustrated), and an interface 1108 for the modem 1116. A storage device 1109 is provided and typically includes a hard disk drive 1110 and a floppy disk drive 1111. A magnetic tape drive (not illustrated) may also be used. A CD-ROM drive 1112 is typically provided as a non-volatile source of data. The components 1105 to 1113 of the computer module 1101, typically communicate via an

interconnected bus 1104 and in a manner, which results in a conventional mode of operation of the computer system 1100 known to those in the relevant art. Examples of computers on which the described arrangements can be practised include IBM-PC's and compatibles, Sun Sparcstations or alike computer systems evolved therefrom.

Typically, the application and session manager programs are resident on the hard disk drive 1110 and read and controlled in its execution by the processor 1105. Intermediate storage of the programs and any data fetched from the network 1120 may be accomplished using the semiconductor memory 1106, possibly in concert with the hard disk drive 1110. In some instances, the application program may be supplied to the user encoded on a CD-ROM or floppy disk and read via the corresponding drive 1112 or 1111, or alternatively may be read by the user from the network 1120 via the modem device 1116. Still further, the software can also be loaded into the computer system 1100 from other computer readable medium including magnetic tape, a ROM or integrated circuit, a magneto-optical disk, a radio or infra-red transmission channel between the computer module 1101 and another device, a computer readable card such as a PCMCIA card, and the Internet and Intranets including email transmissions and information recorded on websites and the like. The foregoing is merely exemplary of relevant computer readable mediums. Other computer readable media may alternately be used.

Industrial Applicability

It is apparent from the above that the arrangements described are applicable to the use of smartcards and their related industries.

The foregoing describes only some embodiments of the present invention, and modifications and/or changes can be made thereto without departing from the scope and spirit of the invention, the embodiment(s) being illustrative and not restrictive. For example, the aforementioned preferred method(s) comprise a particular control flow. There are many other variants of the preferred method(s) which use different control flows without departing the spirit or scope of the invention. Furthermore one or more of the steps of the preferred method(s) may be performed in parallel rather sequential.

In the context of this specification, the word "comprising" means "including principally but not necessarily solely" or "having" or "including" and not "consisting only of". Variations of the word comprising, such as "comprise" and "comprises" have corresponding meanings.

The claims defining the invention are as follows:

1. A method of using multiple smartcards with a single reader, wherein the method comprises:

executing an application upon an insertion of a first smartcard into the reader;

requesting an insertion of a second smartcard into the reader; and

performing an action upon an insertion of the second smartcard into the reader.

2. A method as claimed in claim 1, wherein said performing step comprises the step of:

transmitting, upon insertion of the second smartcard into the reader, data read from the second smartcard to said executing application.

3. A method as claimed in claim 2, wherein said transmitting step comprises:

receiving a message from said application indicating that the second smartcard is required to be inserted in the smartcard reader;

waiting for the insertion of a smartcard in said smartcard reader;

receiving a message from said smartcard reader that a smartcard has been inserted;

determining whether the inserted smartcard is said second smartcard; and

transmitting, upon determination that the inserted smartcard is said second smart card, data read from the second smartcard to said executing application.

4. A method as claimed in claim 2, wherein upon completion of said transmitting step, the method performs the step of:

terminating said application.

5. A method as claimed in claim 2, wherein upon completion of said transmitting step, the method performs the step of:

transmitting, upon insertion of a further smartcard into the reader, data read from the further smartcard to said executing application.

6. A method as claimed in claim 3, wherein said method comprises the steps of:

terminating said application, in the event that a message has been received that the first smartcard has been removed from the smartcard reader and that a message has not been received from said application indicating the second smartcard is required to be inserted in the smartcard reader.

7. A method as claimed in claim 3, wherein the method comprises the steps of:

executing a further application corresponding to a newly inserted further smartcard, in the event that a message has not been received from said application indicating the second smartcard is required to be inserted in the smartcard reader.

8. A method as claimed in any one of the preceding claims, wherein each said smartcard has a unique identifier.

9. A method as claimed in claim 3, wherein each said smartcard has a unique identifier and said determining step determines said inserted smartcard by said unique identifier.

10. A method as claimed in any one of the preceding claims 2 to 9, wherein said data is a computer program.

11. A method as claimed in claim 10, wherein said method comprises the step of:

executing said computer program.

12. A method as claimed in any one of the preceding claims 2 to 9, wherein said data is for information purposes of said application.

13. A system for using multiple smartcards, wherein the system comprises:

a single smartcard reader;

a processor; and

communication means for communicating between said single smartcard reader and said processor; wherein the processor comprises:

means for executing an application upon an insertion of a first smartcard into the reader;

means for requesting an insertion of a second smartcard into the reader; and

means for performing an action upon an insertion of the second smartcard into the reader.

14. A system as claimed in claim 13, wherein said performing means comprises:

means for transmitting, upon insertion of the second smartcard into the reader, data read from the second smartcard to said executing application.

15. A system as claimed in claim 14, wherein said transmitting means comprises:

means for receiving a message from said application indicating that the second smartcard is required to be inserted in the smartcard reader;

means for waiting for the insertion of a smartcard in said smartcard reader;

means for receiving a message from said smartcard reader that a smartcard has been inserted;

means for determining whether the inserted smartcard is said second smartcard; and

means for transmitting, upon determination that the inserted smartcard is said second smart card, data read from the second smartcard to said executing application.

16. A system as claimed in claim 14, wherein said system comprises:

means for terminating said application upon completion of data read from the second smartcard.

17. A system as claimed in claim 14, wherein the system comprises:

means for transmitting, upon insertion of a further smartcard into the reader, data read from the further smartcard to said executing application.

18. A system as claimed in claim 15, wherein said system comprises:

means for terminating said application, in the event that a message has been received that the first smartcard has been removed from the smartcard reader and that a message has not been received from said application indicating the second smartcard is required to be inserted in the smartcard reader.

19. A system as claimed in claim 15, wherein the system comprises:

means for executing a further application corresponding to a newly inserted further smartcard, in the event that a message has not been received from said application indicating the second smartcard is required to be inserted in the smartcard reader.

20. A system as claimed in any one of the preceding claims 13 to 19, wherein each said smartcard has a unique identifier.

21. A system as claimed in claim 15, wherein each said smartcard has a unique identifier and said determining means determines said inserted smartcard by said unique identifier.

22. A system as claimed in any one of the preceding claims 13 to 21, wherein said data is a computer program.

23. A system as claimed in claim 22, wherein said system comprises:

means for executing said computer program.

24. A system as claimed in any one of the preceding claims 13 to 23, wherein said data is for information purposes of said application.

25. A method of interfacing between an application and a single smartcard reader, wherein the method comprises:

executing said application upon insertion of a first smartcard into the reader; and

transmitting, upon insertion of a second smartcard into the reader, data read from the second smartcard to said executing application.

26. A method as claimed in claim 25, wherein said transmitting step comprises:

receiving a message from said application indicating that the second smartcard is required to be inserted in the smartcard reader;

waiting for the insertion of a smartcard in said smartcard reader;

receiving a message from said smartcard reader that a smartcard has been inserted;

determining whether the inserted smartcard is said second smartcard; and

transmitting, upon determination that the inserted smartcard is said second smart card, data read from the second smartcard to said executing application.

27. A method as claimed in claim 25, wherein upon completion of said transmitting step, the method performs the step of:

terminating said application.

28. A method as claimed in claim 25, wherein upon completion of said transmitting step, the method performs the step of:

transmitting, upon insertion of a further smartcard into the reader, data read from the further smartcard to said executing application.

29. A method as claimed in claim 26, wherein said method comprises the steps of:

terminating said application, in the event that a message has been received that the first smartcard has been removed from the smartcard reader and that a message has not been received from said application indicating the second smartcard is required to be inserted in the smartcard reader.

30. A method as claimed in claim 26, wherein the method comprises the steps of:

executing a further application corresponding to a newly inserted further smartcard, in the event that a message has not been received from said application indicating the second smartcard is required to be inserted in the smartcard reader.

31. A method as claimed in any one of the preceding claims 25 to 30, wherein each said smartcard has a unique identifier.

32. A method as claimed in claim 26, wherein each said smartcard has a unique identifier and said determining step determines said inserted smartcard by said unique identifier.

33. A method as claimed in any one of the preceding claims 25 to 32, wherein said data is a computer program.

34. A method as claimed in any one of the preceding claims 25 to 32, wherein said data is for information purposes of said application.

35. Apparatus for interfacing between an application and a single smartcard reader, wherein the apparatus comprises:

means for executing said application upon insertion of a first smartcard into the reader; and

means for transmitting, upon insertion of a second smartcard into the reader, data read from the second smartcard to said executing application.

36. A computer readable medium comprising a computer program for interfacing between an application and a single smartcard reader, wherein the computer program comprises:

code for executing said application upon insertion of a first smartcard into the reader; and

code for transmitting, upon insertion of a second smartcard into the reader, data read from the second smartcard to said executing application.

37. A method for using multiple smartcards, the method substantially as described herein with reference to Figs. 8 to 10 of the accompanying drawings.

38. A system for using multiple smartcards, the system substantially as described herein with reference to Figs. 1 to 11 of the accompanying drawings.

39. A computer readable medium comprising a computer program, the computer program substantially as described with reference to Fig. 10 of the accompanying drawings.

DATED this TWELTH Day of SEPTEMBER 2000

CANON KABUSHIKI KAISHA

Patent Attorneys for the Applicant

SPRUSON&FERGUSON

Abstract

A METHOD AND SYSTEM FOR USING MULTIPLE SMARTCARDS IN A READER

The method is adapted for using multiple smartcards with a single reader. The method executes (804) an application upon an insertion of a first smartcard into the reader. The application can request (808) an insertion of a second smartcard into the reader. The method then performs (812) an action upon an insertion of the second smartcard into the reader.

Fig. 8.

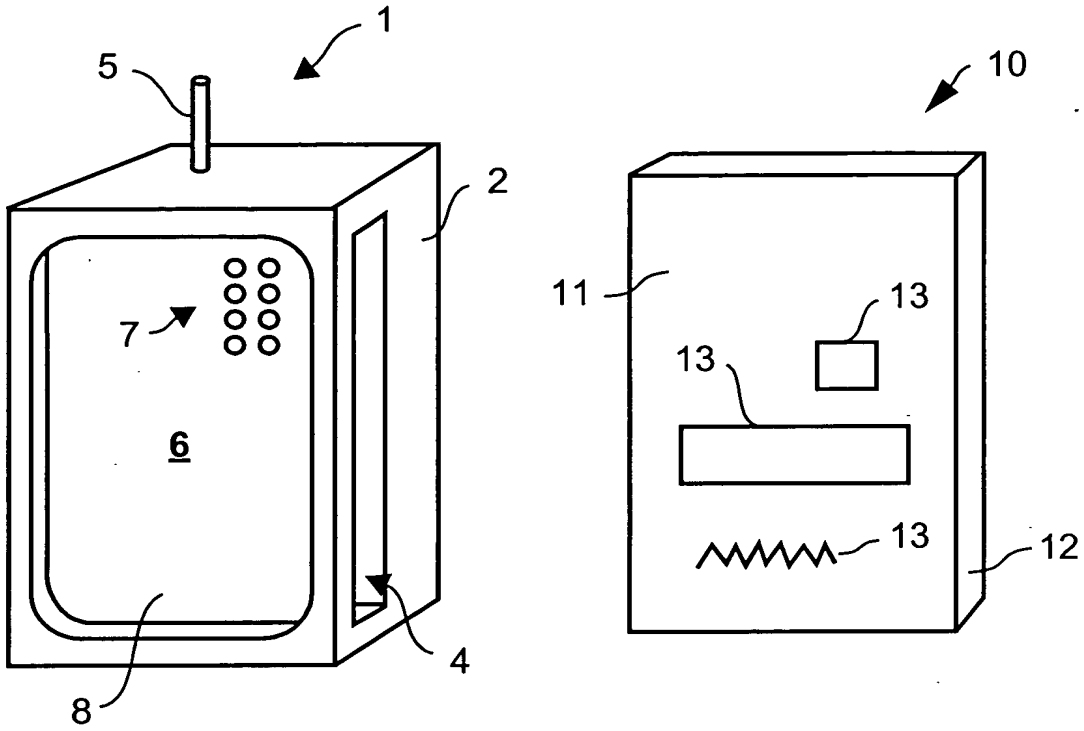

Fig. 1

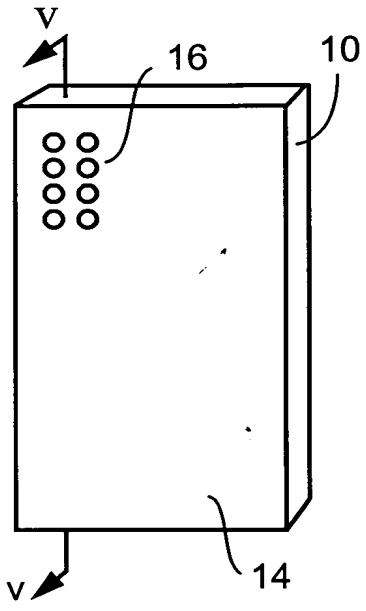

Fig. 2

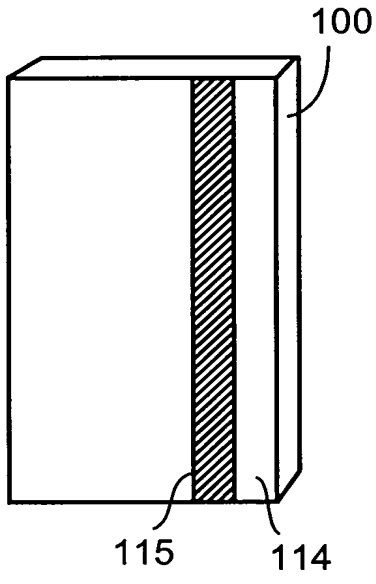

Fig. 3

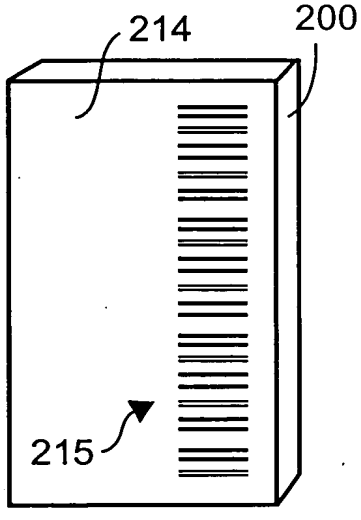

Fig. 4

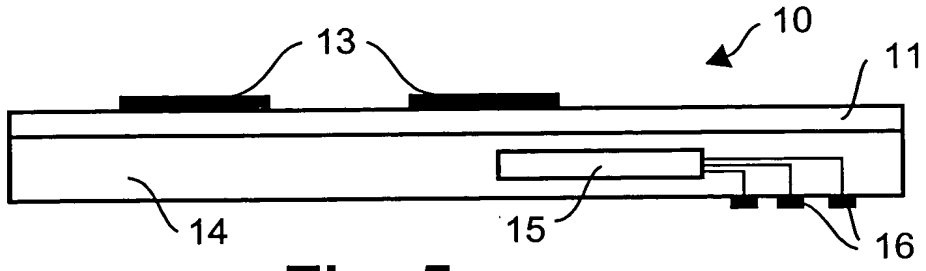

Fig. 5

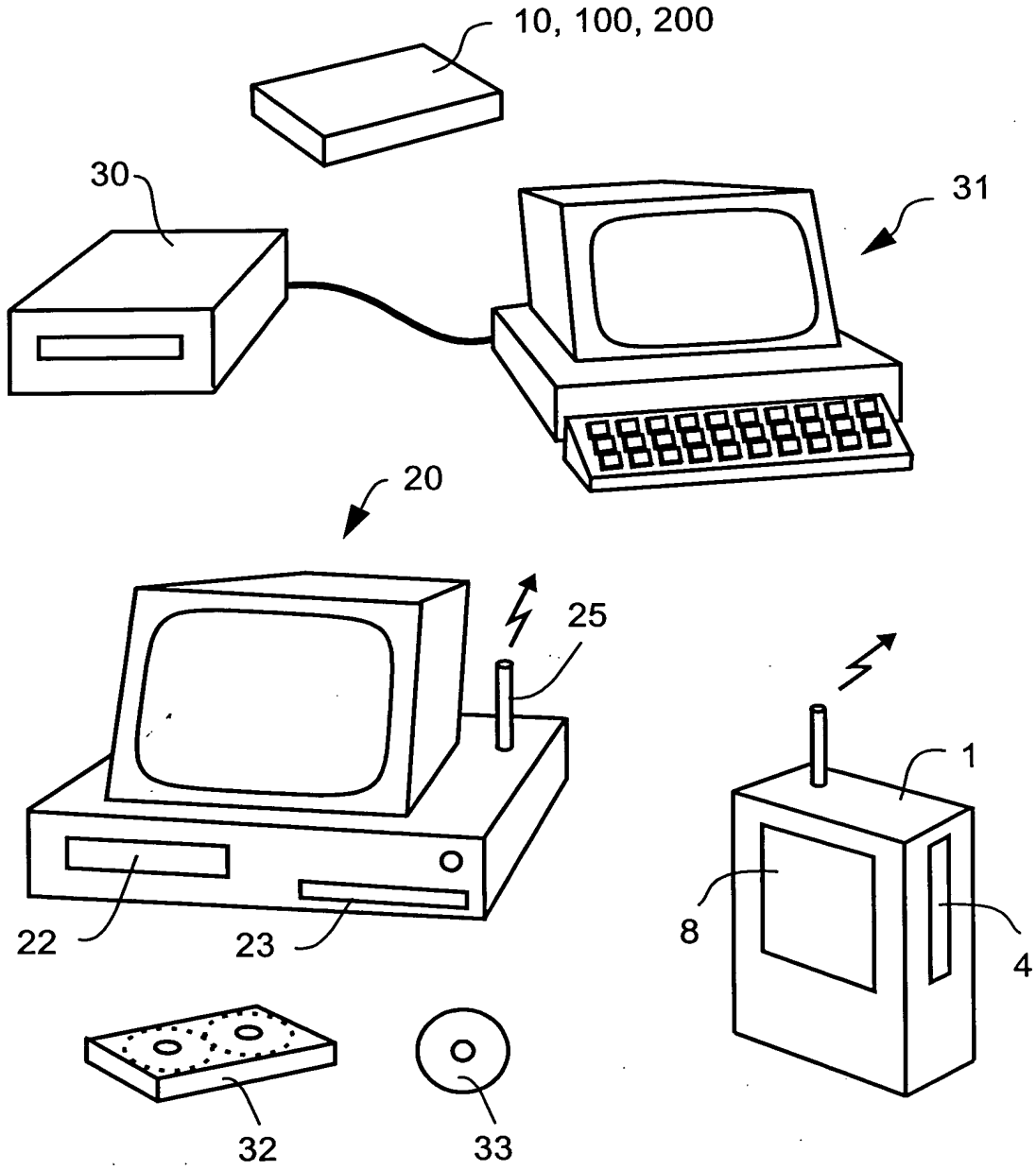

Fig. 6

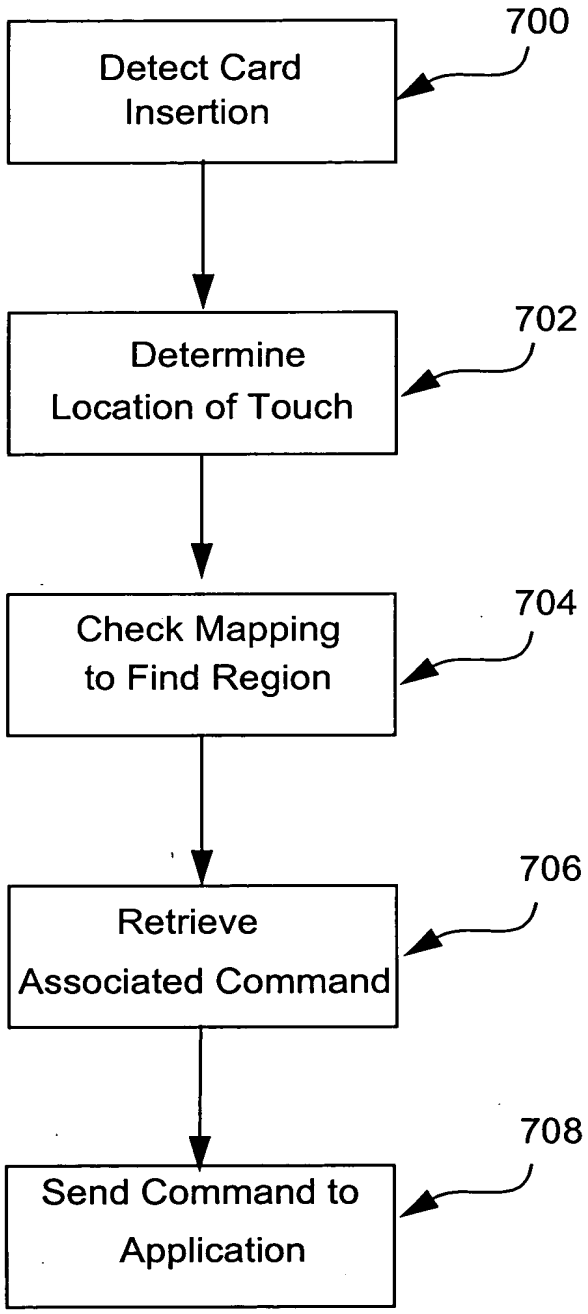
Detect Card Insertion
700
Determine Location of Touch
702
Check Mapping to Find Region
704
Retrieve Associated Command
706
Send Command to Application
708

Fig. 7A

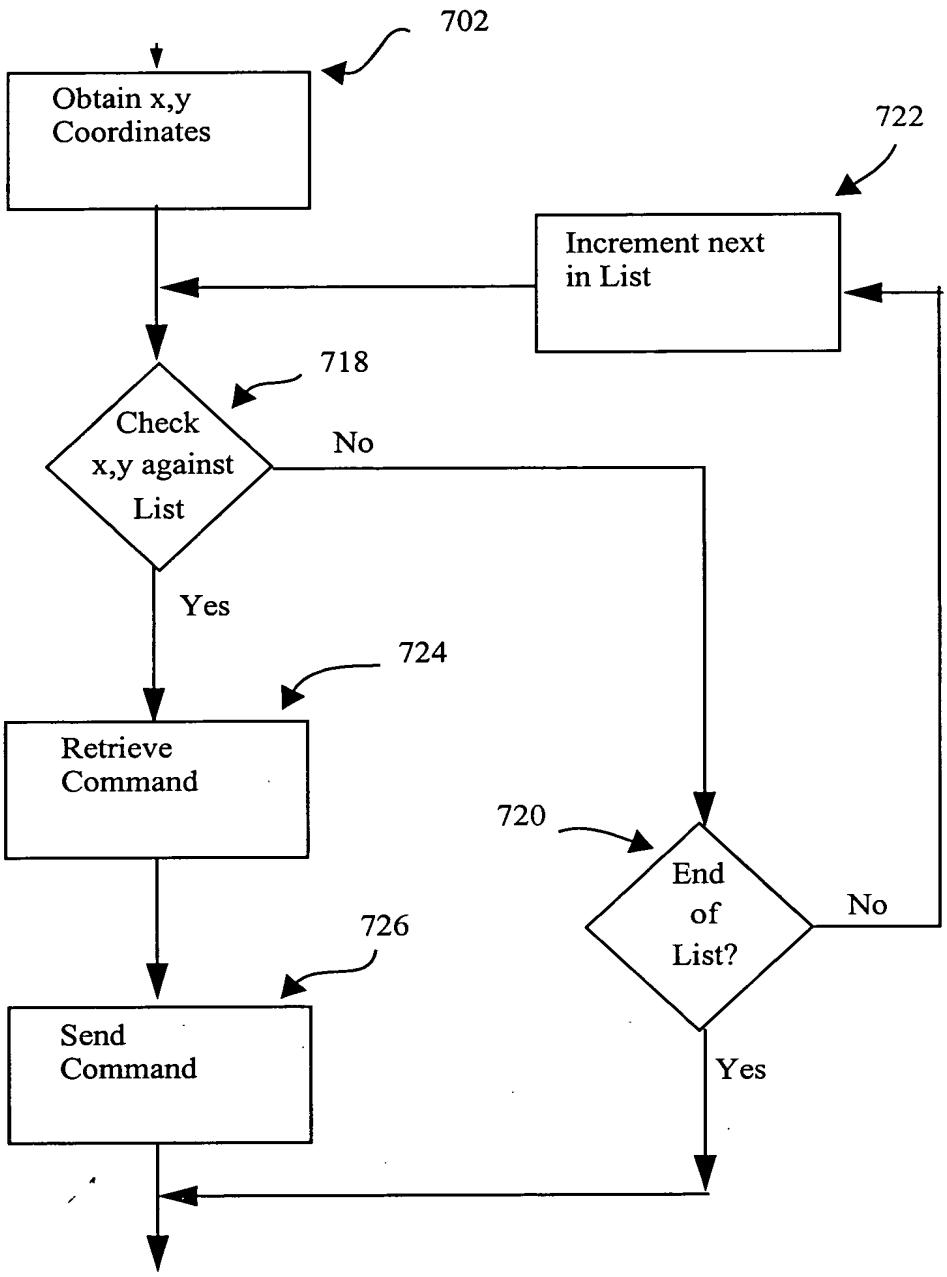
702
Obtain x,y Coordinates
722
Increment next in List
718
Check x,y against List
No
Yes
724
Retrieve Command
720
End of List?
No
726
Send Command
Yes

Fig. 7B

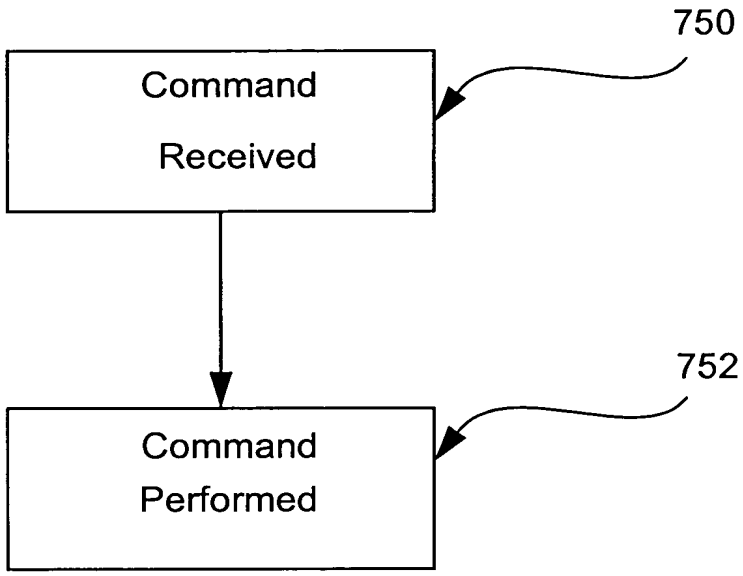

Fig. 7C

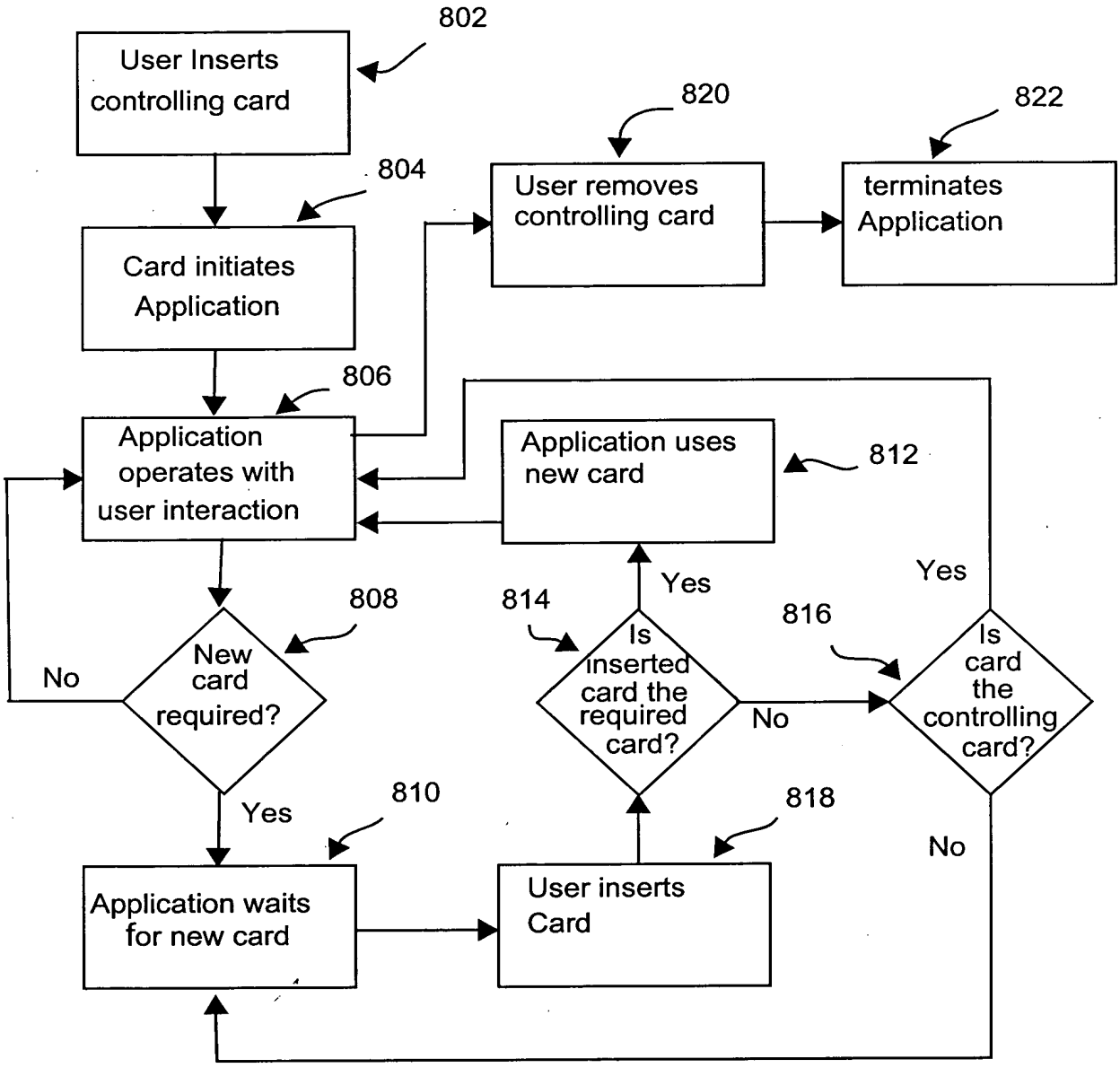
802
User Inserts controlling card
820
822
804
User removes controlling card
terminates Application
Card initiates Application
806
Application operates with user interaction
Application uses new card
812
Yes
Yes
808
814
816
New card required?
Is inserted card the required card?
Is card the controlling card?
No
No
Yes
810
818
No
Application waits for new card
User inserts Card

Fig. 8

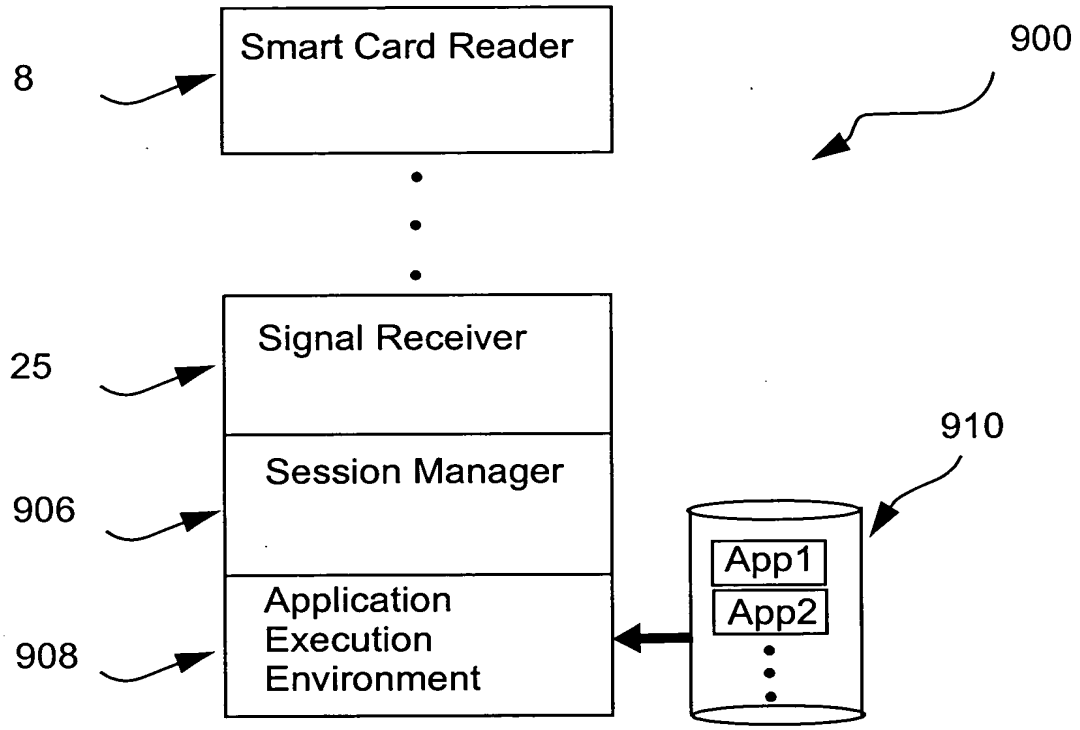
Smart Card Reader
8
900
Signal Receiver
25
Session Manager
906
910
Application
Execution
Environment
908
App1
App2

Fig. 9

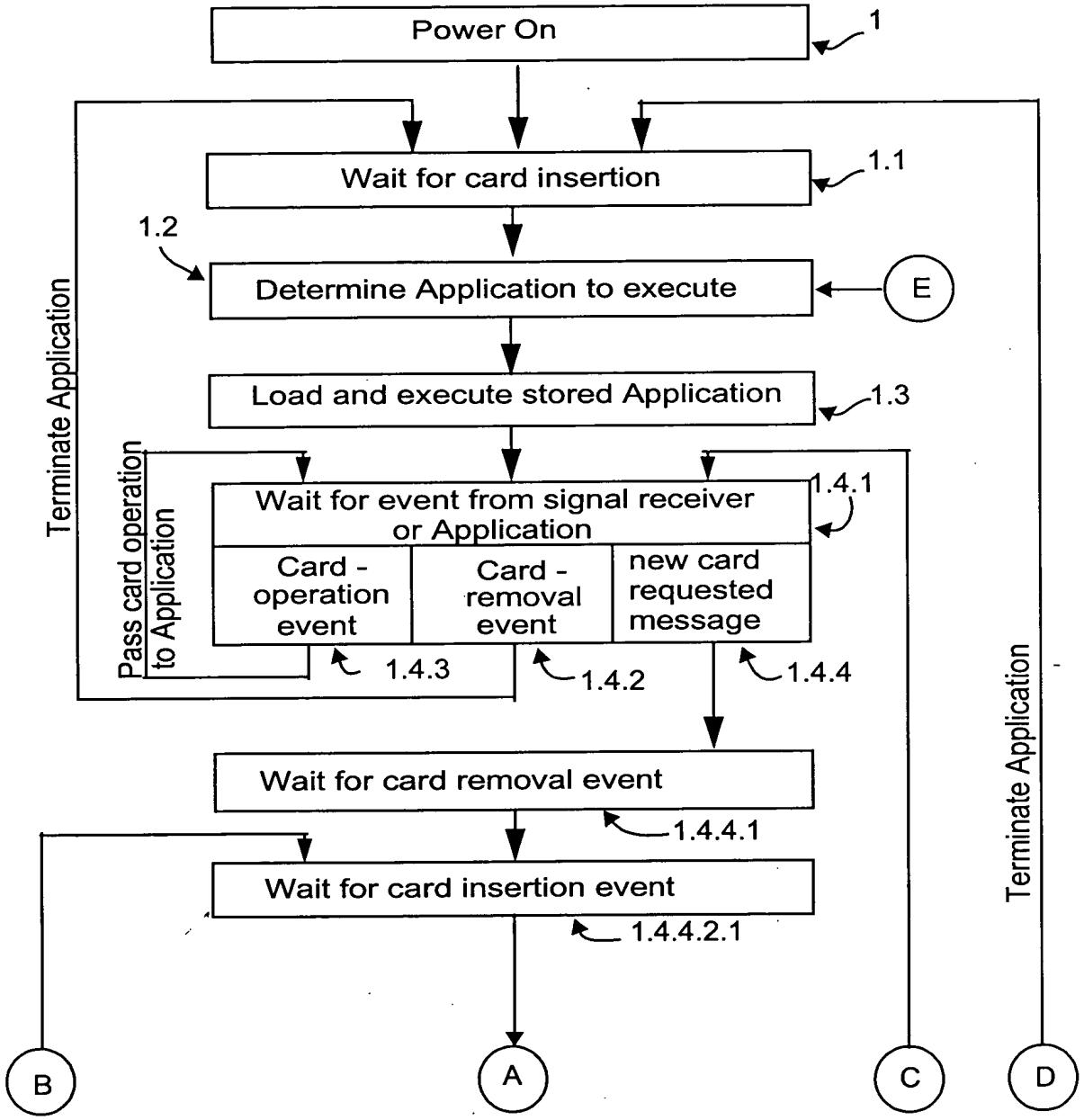
Power On
1
Wait for card insertion
1.1
1.2
Determine Application to execute
E
Load and execute stored Application
1.3
Terminate Application
Pass card operation to Application
Wait for event from signal receiver or Application
1.4.1
Card - operation event
Card - removal event
new card requested message
1.4.3
1.4.2
1.4.4
Wait for card removal event
1.4.4.1
Wait for card insertion event
1.4.4.2.1
Terminate Application
B
A
C
D

Fig. 10A

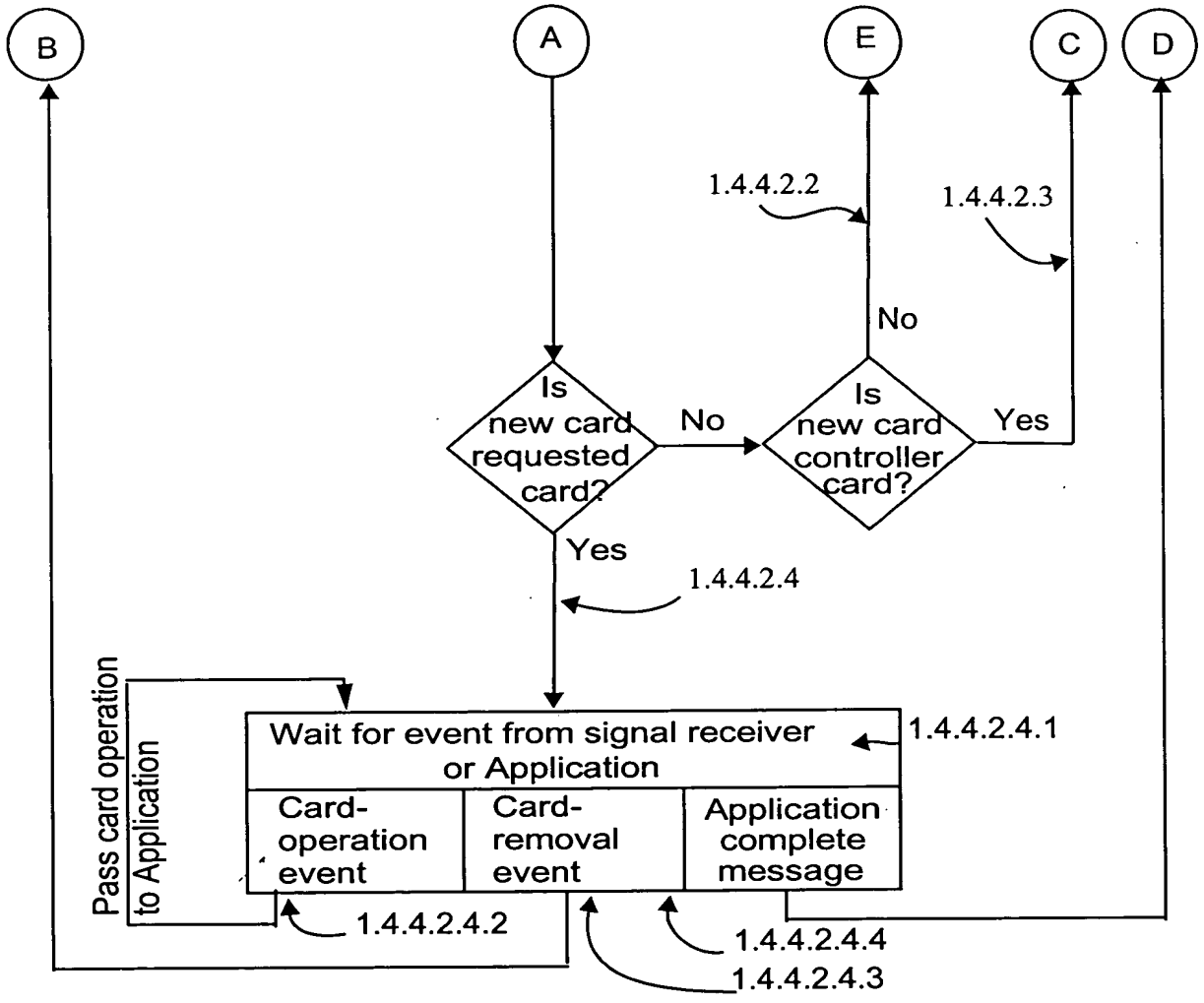
B
A
E
C
D
1.4.4.2.2
1.4.4.2.3
No
Is new card requested card?
No
Is new card controller card?
Yes
Yes
1.4.4.2.4
Pass card operation to Application
Wait for event from signal receiver or Application
1.4.4.2.4.1
Card-operation event
Card-removal event
Application complete message
1.4.4.2.4.2
1.4.4.2.4.4
1.4.4.2.4.3

Fig. 10B

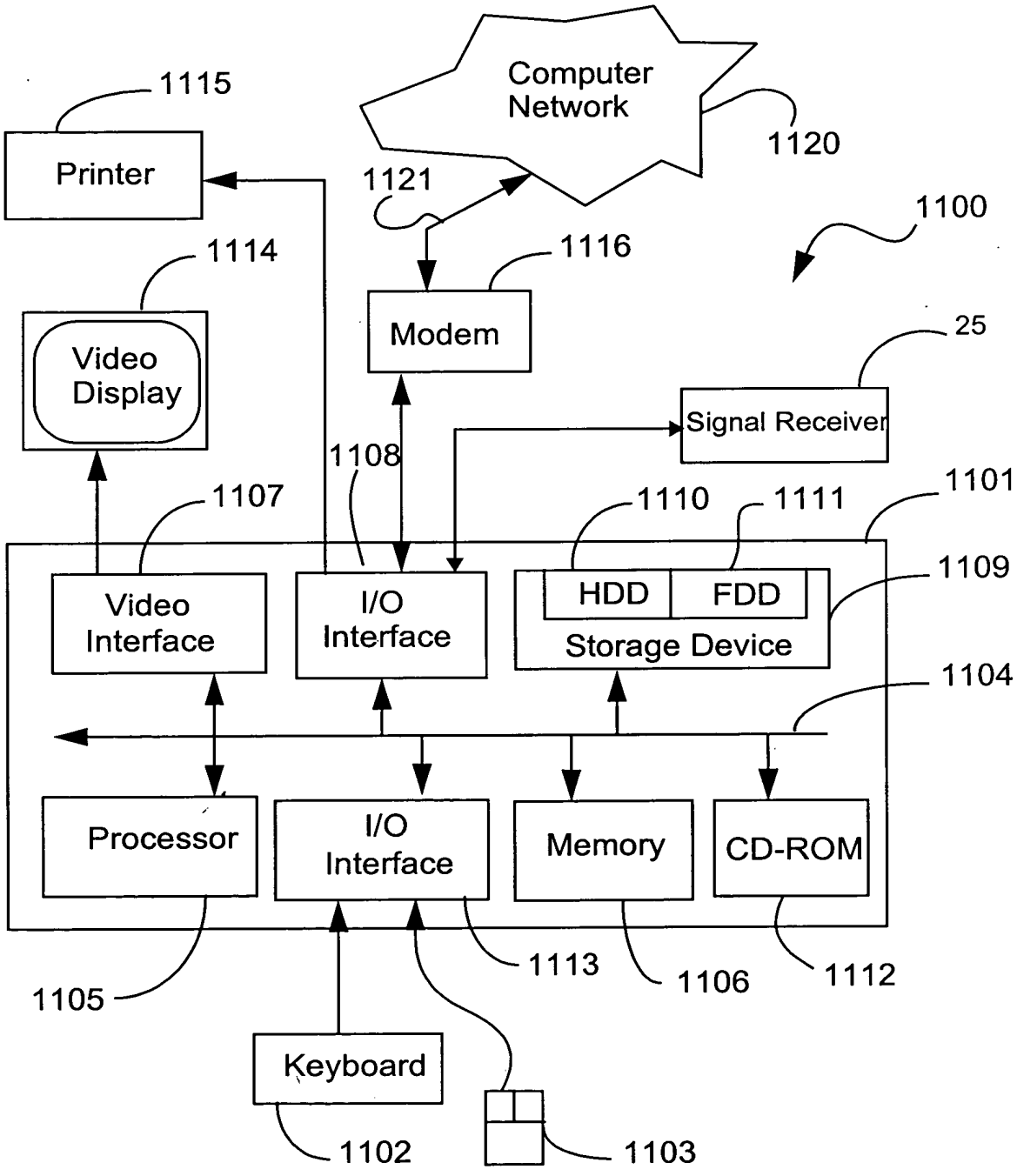
Computer Network
1120
1115
Printer
1121
1100
1114
1116
Video Display
Modem
25
Signal Receiver
1108
1101
1107
1110
1111
1109
Video Interface
I/O Interface
HDD
FDD
Storage Device
1104
Processor
I/O Interface
Memory
CD-ROM
1105
1113
1106
1112
Keyboard
1102
1103

FIG. 11